Genome-Wide Profiling Identified a Set of miRNAs that Are Differentially Expressed in Glioblastoma Stem Cells and Normal Neural Stem Cells.

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Public Summary:
In this study, we identified a set of small RNA molecules that are differentially expressed in the tumor-initiating cells termed glioblastoma stem cells vs normal brain stem cells. These small RNAs also displayed altered expression in brain tumor tissues and are predicted to target tumor-inducing genes or tumor-suppressing genes, respectively. Defining the role of these small RNAs in glioblastoma stem cells may lead to the development of RNA-based therapies for brain tumor patients.

Scientific Abstract:
A major challenge in cancer research field is to define molecular features that distinguish cancer stem cells from normal stem cells. In this study, we compared microRNA (miRNA) expression profiles in human glioblastoma stem cells and normal neural stem cells using combined microarray and deep sequencing analyses. These studies allowed us to identify a set of 10 miRNAs that are considerably up-regulated or down-regulated in glioblastoma stem cells. Among them, 5 miRNAs were further confirmed to have altered expression in three independent lines of glioblastoma stem cells by real-time RT-PCR analysis. Moreover, two of the miRNAs with increased expression in glioblastoma stem cells also exhibited elevated expression in glioblastoma patient tissues examined, while two miRNAs with decreased expression in glioblastoma stem cells displayed reduced expression in tumor tissues. Furthermore, we identified two oncogenes, NRAS and PIM3, as downstream targets of miR-124, one of the down-regulated miRNAs; and a tumor suppressor, CSMD1, as a downstream target of miR-10a and miR-10b, two of the up-regulated miRNAs. In summary, this study led to the identification of a set of miRNAs that are differentially expressed in glioblastoma stem cells and normal neural stem cells. Characterizing the role of these miRNAs in glioblastoma stem cells may lead to the development of miRNA-based therapies that specifically target tumor stem cells, but spare normal stem cells.